

## REMARKS

### **I. Status of the Application**

Claims 27-38 are pending in the application. Claims 39-45 are newly added. Claims 27, 28, and 33 remain rejected under 35 U.S.C. 102(b) as anticipated by Kokubo et al. (U.S. Patent No. 5,068,122). Claims 27, 28, and 32 remain rejected under 35 U.S.C. 102(e) as anticipated by Li (U.S. Patent No. 6,139,585). Claims 27-33 and 36 remain rejected under 35 U.S.C. 102(e) as anticipated by Leitao (U.S. Patent No. 6,069,295). Claims 37 and 38 stand rejected under 35 U.S.C. 102(e) as anticipated by Leitao. Claims 34 and 35 remain rejected under 35 U.S.C. 103(a) as unpatentable over Leitao.

The Applicants have amended the claims to more clearly define and distinctly characterize Applicants' novel invention. Support for the amendments, namely that the coating includes a deposit of crystals nucleated directly onto the implant from solution with the coating having an average bond strength to the implant of between 40 to 65 Mpa, is found at least at page 4 lines 18-21 and page 19 line 36 to page 20 line 2. Claims 33 and 37 were amended to correct inadvertent typographical errors. The amendments presented herein add no new matter. Attached hereto is a marked-up version of the changes made to the claims captioned "Version Of Amendments With Markings To Show Changes Made."

The Examiner has objected to claim 37 because, the Examiner asserts, the claim depends on itself and there is no antecedent basis for the second coating. Applicants respectfully submit that claim 37 has been amended to correct an inadvertent typographical error and now depends from claim 36, and thus includes an antecedent basis for the second coating.

Applicants respectfully request entry and consideration of the foregoing amendments, which are intended to place this case in condition for allowance. Applicants claims are directed to a coating including a deposit of crystals nucleated directly onto the implant from solution and in certain claims with the coating having an average bond strength to the implant of between 40 to 65 Mpa. Applicants respectfully submit that the adhesion characteristic of a coated implant vary with the method used to form the coating, such as nucleating crystals directly on the implant surface and any particular adhesion strength is not predictable from any particular method used to form the coating.

**II. Claims 27, 28, and 33 are novel over Kokubo et al.**

At page 2, paragraph 2 of the present Office Action, claims 27, 28 and 33 remain rejected under 35 U.S.C. § 102(b) as being anticipated by Kokubo et al. In the Office Action dated May 22, 2001, the Examiner asserts that Kokubo et al. teaches “forming a hydroxyapatite coating on metallic or organic substrates by soaking the substrate in an aqueous solution containing constituent ions of hydroxyapatite (abstract).” The Examiner further asserts that the constituent ions “include calcium, phosphate and magnesium (see Table 2) as required by Applicant.” Applicants respectfully traverse the Examiner's rejection based on the amended claims now presented.

Applicants' amended claims 27-38 include a coating including a deposit of crystals nucleated directly onto the implant from solution with the coating having an average bond strength to the implant of between 40 to 65 Mpa. Kokubo et al. teaches coating substrates with a bone-like bioactive apatite film produced by eluting ions from glass into a saturated or supersaturated aqueous solution to cause the ions in solution to precipitate onto a substrate located near the glass. The distance between the glass and the implant is preferably not to exceed 2mm as the distance directly

effects the formation of the coating. Kokubo et al. teaches that its coatings produced by the eluting glass method have a maximum bond strength of 11 Mpa, far below applicants' claimed range. Regarding claims 39-45, Kokubo does not teach a coating of octacalcium phosphate.

Accordingly, Kokubo fails to teach all of Applicants' claim limitations.

### **III. Claims 27, 28, and 32 are novel over Li**

At page 2, paragraph 3 of the present Office Action, claims 27, 28 and 32 remain rejected under 35 U.S.C. § 102(e) as being anticipated by Li. In the Office Action dated May 22, 2001, the Examiner asserts that "Li teaches a coated implant wherein the coating comprises calcium ions, phosphate ions, magnesium ions and carbonate ions (abstract and claims)." The Examiner further asserts that the "implant substrate may be metal, ceramic, or polymer (col. 4, lines 59)." Applicants respectfully traverse the rejection based on the amended claims now presented.

Applicants' amended claims 27-38 are directed to a coating include a deposit of crystals nucleated directly onto the implant from solution and with the coating having an average bond strength to the implant of between 40 to 65 Mpa. Li teaches a simple immersion technique for producing its coating. The implant is simply allowed to rest in a solution of ions. The concentration, pH, temperature or other conditions are not altered or changed to affect the coating. Col. 5 lines 14-37. An artificial atmosphere including carbon dioxide is created over the solution in one embodiment. Col. 6 lines 14-63. However, Li does not teach how this artificial atmosphere leads to coating formation. Li does not teach that the carbon dioxide is bubbled through the solution to decrease pH and then it is allows to escape from solution to increase pH. No pH change at all is mentioned by Li. Li teaches generally that its "chemically bonded coating ensures excellent adhesion

of the coating to the substrate. Col. 4 lines 50-52. Without any supporting data, Li speculates that "the adhesion strength of the coating to a polished substrate is believed to be in excess of 30 MPa."

Li does not teach a coating that has an average bond strength to the implant of between 40 to 65 Mpa. Li's adhesion strength is speculated to be only 30 MPa without any supporting experimental data, which is far below the claimed range. Regarding claims 39-45, Li does not teach a coating of octacalcium phosphate.

Accordingly, Li fails to teach all of Applicants' claim limitations.

#### **IV. Claims 27-33, and 36-38 are novel over Leitao**

At page 3, paragraph 4 of the present Office Action, claims 27-33 and 36 remain rejected and claims 37 and 38 stand newly rejected under 35 U.S.C. 102(e) as being anticipated by Leitao. With regard to claims 27-33 and 36, in the Office Action dated May 22, 2001, the Examiner asserts that "Leitao teaches coating a metal or ceramic substrate with an amorphous calcium phosphate layer, which can be made from a combination of calcium and phosphate ions, together with hydroxide, magnesium, and/or chloride ions (col. 2, lines 20-25). The calcium phosphate layer may also form hydroxyapatite (col. 5, line 13)." The Examiner further asserts that "Leitao teaches pre-treatment of the substrate, prior to coating of said implant, using a chemical surface treatment, such as treatment with a strong mineral acid, or a mechanical surface treatment, such as sanding or scoring (col. 2, lines 40-50)." In regard to claim 36, the Examiner asserts that "Leitao teaches pre-coating with the above coating material and then placing the implant into the body where an additional calcium phosphate layer is formed on the implant in vivo (col. 3, lines 1-6)." In the instant Office Action, the Examiner asserts that with regard to claims 37 and 38, "Leitao teaches a coating composition of

‘OCP’ (Table 2), which is octacalcium phosphate.” Applicants respectfully traverse the rejection based on the amended claims now presented.

Applicants’ amended claims 27-38 are directed to a coating including a deposit of crystals nucleated directly onto the implant from solution and with the coating having an average bond strength to the implant of between 40 to 65 Mpa. Leitao teaches soaking a roughened implant surface in a solution containing calcium and phosphate ions to produce a coating. The roughened surface causes the formation of the coating layer. The formation is not attributable to changes in pH, temperature, ion concentrations, etc. Leitao does not teach the coating having an average bond strength to the implant of between 40 to 65 Mpa. Although Leitao reports evidence of chemical bonding between the substrate and the coating, no adhesion strengths between the coatings and the substrate are reported by Leitao. Regarding claims 39-45, Leitao does not teach a coating of octacalcium phosphate nucleated directly onto the implant from solution.

Accordingly, Leitao fails to teach all of Applicants’ claim limitations.

**V. Claims 34 and 35 are not obvious over Leitao**

At page 3, paragraph 5 of the present Office Action, claims 34 and 35 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Leitao. In the Office Action dated May 22, 2001, the Examiner asserts that the Leitao reference additionally “teaches that the calcium phosphate layer is preferably 1-50 microns (col. 2, line 19), overlapping the ranges set forth by the Applicant.” The Examiner further asserts that “[o]verlapping ranges are *prima facie* evidence of obviousness.” Applicants respectfully traverse the present rejection based on the amended claims now presented.

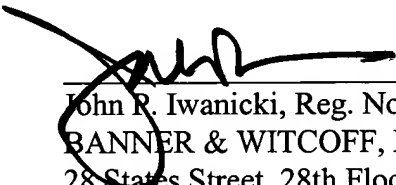
As discussed above, Leitao fails to teach a coating including a deposit of crystals nucleated directly onto the implant from solution with the coating having an average bond strength to the implant of between 40 to 65 Mpa. No reference of record has been identified that cures the deficiency of Leitao. Additionally, Leitao does not teach or suggest a coating of octacalcium phosphate nucleated directly onto the implant from solution. Accordingly, Applicants respectfully request the Examiner withdraw the obviousness rejection.

## VI. CONCLUSION

Reconsideration and allowance of all the pending claims is respectfully requested. If a telephone conversation with Applicants' attorney would expedite prosecution of the above-identified application, the Examiner is urged to call the undersigned at (617) 227-7111.

Respectfully submitted,

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## Version of Amendments with Markings to Show Changes Made

27. (Twice Amended) A coated implant comprising an implant and a coating, wherein said coating comprises a deposit of crystals nucleated directly onto the implant from solution with the coating having an average bond strength to the implant of between 40 to 65 Mpa, wherein said coating comprises magnesium ions, calcium ions, and phosphate ions, and wherein said coating induces formation of bone cells from progenitor cells.

33. (Amended) The coated implant of claim 27, said coating comprising one or more of amorphous carbonate calcium phosphate, hydroxyapatite, calcium deficient apatite, [and] hydroxyl carbonate apatite, [oroctacalcium] octacalcium phosphate, dicalcium phosphate dihydrate or calcium carbonate.

36. (Twice Amended) A coated implant comprising an implant, a first coating, and a second coating, wherein said first coating comprises a deposit of crystals nucleated directly onto the implant from solution with the coating having an average bond strength to the implant of between 40 to 65 Mpa wherein said first coating [comprising] comprises magnesium ions, calcium ions, and phosphate ions, and wherein said coating induces formation of bone cells from progenitor cells,  
wherein [a] the second coating [is applied to said implant after said first coating, said second coating comprising] comprises calcium and phosphate ions.

37. (Amended) The coated implant of claim [37] 36 wherein the second coating comprising calcium and phosphate ions further comprises octacalcium phosphate.